

Remarks

Claims 1-25 are pending in the application. Claims 17, 18, 20, 23, and 24 have been amended.

Claims 20-23 and 25 are copied in all material respects from U.S. Patent No. 5,009,693. Claims 20-23 and 25 in this reissue application correspond respectively to interfering claims of the '693 patent as follows: claim 20 to claim 5, claim 21 to claim 10 (with immaterial deletions), claim 22 to claim 12 (with immaterial deletions), claim 23 to claim 13 and claim 25 to claim 14 (with immaterial deletions) of the '693 patent. Claim 24 is patterned after claim 23.

The specification was objected to under 35 U.S.C. § 112, first paragraph, for not providing support for the invention as now claimed in claims 17-25. Applicants respectfully traverse this rejection.

While applicants' invention is described as a glass bending and tempering apparatus, the specification supports applicants' teaching of the improved tempering apparatus now described in claims 17-20. The claimed tempering apparatus is disclosed as having upper and lower movable rows of spaced apart quench tubes each having a surface including quench openings and means for moving the rows of tubes such that the surfaces, including the quench openings, generally conform to the glass sheet. The specification describes the disclosed quench in response to the recognized problem of non-uniform quenching of bent glass sheets in prior quenches. The disclosure of the additional use of that structure to first bend the glass sheet in the same location prior to quenching should not be construed to limit applicants' otherwise clearly enabling disclosure of the claimed deformable quench. While bending the glass sheet is disclosed, and may be, a consequence of deforming the platens, it is not essential to enable tempering. One important teaching is that the quench openings are movable so that they provide equal thermal conditions. Otherwise, there would be no purpose to indepen-

fact - of a glass, no disclosure of how to feed in a bent sheet or a bent sheet into tempering

dently recognize the problem presented and the disclosed solution.

In the BACKGROUND ART, the specification separately acknowledges the problem of quenching bent glass sheets in a non-uniform manner, stating:

"... once the glass sheet arrives at the quenching station, the quenching air typically is applied in a non-uniform manner with respect to the bend in the bent glass sheet causing unbalanced rates of cooling over the surface of the glass sheet." (Column 1, lines 52-56).

Applicants respond to this problem in the DISCLOSURE OF INVENTION, by noting with respect to this tempering feature that:

"Another object of the invention is to provide an apparatus that has movable quench openings that move with the surfaces of the flat glass sheet to provide equal thermal conditions during tempering and a more uniformly tempered glass sheet." (Column 2, lines 38-42).

Moreover, the ABSTRACT describes such "a glass bending and tempering apparatus" but states as an independent feature of the invention that:

"Quenching gas is supplied by both platens (14, 22) through quench openings (18) that move with the platen (14, 22) to temper the bent glass sheet between the platens."

The object of uniform quenching is independently supported throughout the specification which states:

"In carrying out the above objects" The first platen is deformable and includes an actuator for deforming the first platen from a planar shape to a bent shape. The first platen includes quench openings throughout. The quench openings of the first platen are movable with the platen during the deformation of the platen. A second platen has quench openings throughout and opposes

the first platen with the glass sheet between the platens." (Column 2, lines 53-60).

Subsequently, the specification states:

"After the bending, quenching gas is supplied to the quench openings of both platens and thereby to both sides of the glass sheet to temper the bent glass sheet between the platens." (Column 3, lines 5-8).

* * *

"Both of the platens include quench openings that move therewith during the deformation of the platens and subsequently supply quenching glass to temper the bent glass sheet." (Column 3, lines 24-27).

* * *

"The above object and other objects, features and advantages of the present invention are readily apparent from the following detailed description of the best mode for carrying out the invention when taken in connection with the accompanying drawings." (Column 3, lines 64-68).

The specification and BRIEF DESCRIPTION OF THE DRAWINGS refers to certain drawings in support of this stated object of the invention which is:

". . . to provide an apparatus that has movable quench openings that move with the surfaces of the flat glass sheet to provide equal thermal conditions during tempering and a more uniformly tempered glass sheet."

In particular, Figures 2, 3 and 5-8 illustrate the structure for providing such "more uniformly tempered glass sheet" in accordance with such object of the invention.

Under BEST MODE FOR CARRYING OUT THE INVENTION, the specification continues to describe what is intended to be covered and secured by the original patent:

"The first (lower) platen includes quench openings 18 throughout a surface 20 of the platen, as seen in Figure 2. The quench openings 18 are movable with the platen 14 during deformation of the platen

A second (upper) platen 22 also has quench openings 18 throughout a surface 20' of the platen, best seen in Figure 3. The second platen 22 opposes the first platen 14 with the glass sheet 12 therebetween. (Column 4, lines 57-65).

* * *

Quenching gas is supplied to the quench openings of both platens 14, 22 and thereby to both sides of glass sheet 12 to temper the bent glass sheet between the platens." (Column 5, lines 10-13).

* * *

"The upper platen 22 is initially conformingly deformable to the shape of the lower platen 14 as the heated glass sheet 12 is moved with the lower platen" (Column 4, lines 28-32).

* * *

"Both of the platens 14, 22 include quench openings 18 that move with the platens during the deformation of the platens and subsequently supply quenching gas to temper the bent glass shape." (Column 5, lines 35-38).

* * *

"Quench tubes 32 define the quench openings 18 of lower platen 14 and rotatably support drive shafts 28 such that the drive wheels 30 move the heated glass sheet 12 during . . . quenching. A control 34 and reversible drive electric motors 36 drive drive wheels 30 to index the glass sheet 12 into the glass . . . tempering apparatus, oscillate the glass sheet during . . . tempering and index the glass sheet out of the apparatus after the . . . quenching

As shown in Figure 3 of the drawings, the upper platen 22 includes idler shafts 38 and idler wheels 40 mounted on the idler shafts to engage the heated glass sheet 12 and to rotate with movement of the glass sheet. As with the lower platen 14, quench tubes 32 define the quench openings 18 of the upper platen 22 and rotatably support the idler shafts 38." (Column 5, lines 44-60).

* * *

"With further reference to Fig. 1 of the drawings, apparatus 10 includes a source 44 of quenching gas and a connector 46 for connecting the source of quenching gas to the quench tubes 32. Spacer wheels 48 are mounted to the platens 14, 22 and separate the platens from contact so that the heated glass sheet 12 can be introduced therebetween." (Column 6, lines 7-13).

* * *

"Figs. 5 through 8 illustrate a cycle of operation of apparatus 10. In Fig. 5, platens 14, 22 are in a planar spaced configuration for receiving the heated glass sheet 12 which has been heated in a glass heating furnace, not shown. Actuator 42 has been operated to maintain upper platen 22 in a spaced planar position above lower platen 14. After the heated glass sheet 12 has been indexed onto lower platen 14 by operation of drive wheels 30, beneath upper platen 22, the lower platen 14 is raised and deformed by actuator 16 to a preset profile . . . while oscillating the glass sheet between platens 14, 22...." The glass sheet 12 is then immediately quenched to provide the desired mechanical characteristics.

Figure 7 of the drawings illustrates the post bending position of the glass sheet bending and quenching cycle wherein actuator 42 maintains the upper platen 22 against template 24 while at the same time lower platen 14 is lowered by operation of actuator 16 to thereby allow

the bent glass sheet 12 to be indexed out of apparatus 10." (Column 6, lines 18-43).

The original patent includes claims 1-16. But in each of the claims the claimed invention is more narrowly defined than was intended to be secured by the object "to provide an apparatus that has movable quench openings that move with the surface of the glass sheet to provide equal thermal conditions during tempering in a more uniformly tempered glass sheet." (Underlining added).

The invention disclosed in this reissue application is included in each of claims 1-16 as:

". . . said first platen including quench openings throughout the extent thereof; said quench openings of the first platen movable therewith during the deformation of the platen; a second platen having quench openings throughout the extent thereof and opposing the first platen in spaced relationship with the glass sheet therebetween; . . . and quenching gas being supplied to the quench openings of both platens and thereby to both sides of the glass sheet to temper the bent glass sheet between the platens."

But in addition to limitations defining such quenching or tempering invention, each of claims 1-16 throughout their prosecution, were inadvertently and unnecessarily limited, *inter alia*, to apparatus for "glass bending."

In further response to the Examiner's specific § 112 rejections, the claims 17-25 now in the application are parsed below and related to specific disclosure in the original patent emphasized above.

Fig. 2, not shown. w/ claim language

17. Apparatus for more uniformly tempering a glass sheet comprising:

opposing upper and lower movable rows of spaced apart quench tubes, each row of quench tubes having a surface including quench openings;

means for moving the rows of quench tubes such that the surfaces including the quench openings generally conform to the glass sheet;

means for movably engaging the glass sheets connected to said movable rows of quench tubes; and

means to supply quenching gas through the quench openings to uniformly temper a glass sheet therebetween.

18. Glass bending and tempering apparatus comprising:

a first deformable platen for receiving a heated glass sheet and including a plurality of first longitudinally extending quench tubes, each tube including a surface having quench openings that

"... a pair of opposed bending platens ..." (Column 4, lines 5-6). Spaced apart quench tubes 32 having a surface 20' including quench openings 18 are shown in movable rows in Fig. 3 for the upper bending platen. Spaced apart quench tubes 32 including a surface 20 having quench openings 18 are shown in movable rows in the Fig. 2 "plan view of a lower bending platen", (column 4, lines 7 and 8). Figs. 5-8 shows the platens 14,22 opposing each other.

As shown in Fig. 2 of the drawings, "... the lower platen 14 includes ... drive wheels 30" (column 5, lines 39-40).

"... quenching gas (from source 44) is supplied to ... both sides of glass sheet 12" (Column 5, lines 10-12).

"... a first platen for receiving a heated glass sheet ..." (column 2, line 52). Lower quench tubes 32 including a surface 20 having quench

move with the tubes during the deformation of the first platen;

a second deformable platen having a second plurality of longitudinally extending quench tubes, each tube including a surface having quench openings that move with the second plurality of tubes during deformation of the second platen;

the surface having quench openings of the first deformable platen and the surface having quench openings of the second deformable platen opposing each other when a glass sheet is therebetween; and

means to supply quenching gas through the quench openings to temper such glass sheet.

19. Glass bending and tempering apparatus as in claim 18 further comprising:

an actuator connected to one of the plurality of longitudinally extending quench tubes for deforming the platen from a planar shape to a bent shape.

openings 18 are shown longitudinally extending in the Fig. 2 "plan view of a lower bending platen (14)", (column 4, line 7).

Upper quench tubes 32 including a surface 20' having quench openings 18 are shown longitudinally extending in the Fig. 3 view of the upper platen 22.

"a pair of opposed bending platens (column 4, lines 5-6).
". . . quenching gas (from source 44) is supplied to . . . both sides of glass sheet . . ."
(Column 3, lines 5-7, column 5, lines 10-12).

". . . a source 44 of quenching gas and a connector 46 for connecting the source of quenching gas to the quench tubes 32."
(Column 6, lines 8-10).

". . . includes an actuator 16 for deforming the platen from a planar shape to a bent shape."
(Column 4, lines 47-49);

". . . an actuator 16 for deforming the (lower) platen from a planar shape to a bent

shape", re Figs. 5-8. See also last 4 lines of Abstract; column 2, lines 38-42; column 3, lines 24-27; and column 5, lines 35-38.

20. Apparatus for tempering glass sheets comprising:

a quench section including upper quench tubes arranged in longitudinal rows which are spaced apart across the width of the quench section,

the quench section also including lower quench tubes arranged in longitudinal rows which are spaced apart across the width of the quench section,

each longitudinal row of lower quench tubes being supported in the quench section,

quench rollers in the quench section rotatably mounted in longitudinal rows between pairs of lower quench tubes for transporting the glass sheet in the quench section,

Upper quench tubes 32 are shown spaced apart in longitudinal rows across the platen in Fig. 3.

Lower quench tubes 32 are shown spaced apart in longitudinal rows in the Fig. 2 "plan view of a lower bending platen", (column 4, line 7) and "... across the platen 14. . . ." (Column 4, lines 54-56).

"Actuator 16 is illustrated as a cable driven mechanical actuator 16' in Fig. 1, and also as a plurality of fluid actuatable piston and cylinder arrangements 17 in Figs. 5 through 8" (column 4, lines 49-53).

As shown in Fig. 2 of the drawings, "the lower platen 14 includes ... drive wheels 30 ... to provide movement of the glass sheet during platen deformation" (Column 5, lines 39-43). Such wheels 30

power means connected to the quench rollers for rotating them,

means in the quench section for changing the vertical position of the lower quench tubes and the quench rollers to a quench position where the lower quench tubes and the quench rollers have the same contour as the glass sheet, and

means in the quench section for changing the vertical position of the upper quench tubes to a quench position where the upper quench tubes have the same contour as the glass sheet.

21. An oven for use in a glass bending apparatus comprising:

a heating section;

a bending section adjacent to the heating section;

are shown in longitudinal rows between pairs of quench tubes in Figs. 2 and 5-8.

"reversible drive electric motors 36 drive drive wheels 30" (Column 5, lines 48-53).

Re Figs. 1 and 5-8, "Actuator 16 is controllable to control the amount of bending or deformation across the platen 14." (Column 4, lines 54-56);

". . . an actuator 16 for deforming the (lower) platen from a planar shape to a bent shape", re Fig. 1 (column 4, lines 47-49).

". . . upper platen further includes an actuator 42 . . . for raising the upper platen . . . and furthermore allow for returning the upper platen to a planar shape" (Column 5, line 61 to column 6, line 2).

"heating furnace not shown" (Column 6, lines 22-23).

"In Fig. 5, platen 14, 22 are in a spaced, planar configuration for receiving the heated glass

means in the oven for heating a glass sheet;

the bending section having a plurality of mini-rolls arranged in longitudinal rows spaced apart across the width of the oven for conveying the glass sheet in the bending section;

power means connected to the mini-rolls for rotating them; and

means connected to each longitudinal row of mini-rolls to change the vertical position of the mini-rolls to a glass bending position where the vertical position of each longitudinal row of mini-rolls across the width of the oven has the contour of a desired bend for bending the hot, softened glass sheet to the desired contour.

22. Apparatus for bending glass sheets, comprising:

an oven for receiving glass sheet and for heating the glass sheet to a hot,

sheet 12 which has been heated" (Column 6, lines 19-22).

". . . a glass heating furnace" (Column 6, lines 22-23).

As shown in Fig. 2 of the drawings, "the lower platen 14 includes . . . drive wheels 30 . . . to provide movement of the glass sheet during platen deformation that provides the bending." (Column 5, lines 39-43). Such wheels 30 are shown in longitudinal rows across the platen in Figures 2 and 5-8.

"reversible drive electric motors 36 drive drive wheels 30" (Column 5, lines 48-53).

Re Figures 1 and 5-8, "Actuator 16 is controllable to control the amount of bending or deformation across the platen 14." (Column 4, lines 54-56).

" . . . glass heating furnace, not shown" (Column 6, lines 22-23).

softened condition, the oven having a heating section; and

a bending section adjacent to the heating section;

means in the oven for heating a glass sheet;

the bending section having a plurality of mini-rolls arranged in longitudinal rows spaced apart across the width of the oven for conveying the glass sheet in the bending section;

power means connected to the mini-rolls for rotating them;

means connected to each longitudinal row of mini-rolls to change the vertical position of the mini-rolls to a glass bending position where the vertical position of each longitudinal row of mini-rolls across the width of the oven has the contour of a desired bend for bending the hot, softened glass sheet to the desired contour; and

means for quenching the bent glass sheet.

"In Fig. 5, platen 14,22 are in a planar spaced configuration for receiving the heated glass sheet 12 which has been heated" (Column 6, lines 19-22).

"... a glass heating furnace" (Column 6, lines 22-23).

As shown in Fig. 2 of the drawings, "the lower platen 14 includes ... drive wheels 30" (column 5, lines 39-40). Such wheels 30 are shown in longitudinal rows in Figures 2 and 5-8, "across the platen 14" (column 4, line 56).

"reversible drive electric motors 36 drive drive wheels 30" (Column 5, lines 48-53).

Re Figures 1 and 5-8, "Actuator 16 is controllable to control the amount of bending or deformation across the platen 14." (Column 4, lines 54-56).

"quenching gas (from source 44) is supplied to ... both sides

23. The apparatus of claim 22, wherein the quench means includes a quench section comprising:

upper quench tubes arranged in longitudinal rows;

lower quench tubes arranged in longitudinal rows; and

means connected to the upper and lower rows of quench tubes for changing the vertical position of each row of quench tubes to a quench position where the upper quench tubes have the same contour as the top surface of the glass sheet and the lower quench tubes have the same contour as the bottom surface of the glass sheet.

of glass sheet 12 to temper the bent glass sheet" (Column 5, lines 10-13).

". . . a source 44 of quenching gas and a connector 46 for connecting the source of quenching gas to the quench tubes 32." (Column 6, lines 8-10).

Quench tubes 32 are shown arranged in longitudinal rows in Fig. 3.

Lower quench tubes 32 are shown arranged in longitudinal rows in the Fig. 2 "plan view of a lower bending platen", (column 4, line 7).

". . . upper platen further includes an actuator 42 . . . for raising the upper platen . . . and furthermore allow for returning the upper platen to a planar shape" (Column 5, line 61 to column 6, line 2); "an actuator 16 for deforming the (lower) platen from a planar shape to a bent shape", re Figures 5-8. See also last 4 lines of Abstract; column 2, lines 38-42; column 3, lines 24-27; and column 5, lines 35-38.

24. The apparatus of claim 22, wherein the quench means includes a quench section comprising:

upper quench tubes arranged in longitudinal rows;

lower quench tubes arranged in longitudinal rows; and

means connected to at least one of the upper and lower rows of quench tubes for changing the vertical position of each row of quench tubes to a quench position where the upper quench tubes have the same contour as the top surface of the glass sheet and the lower quench tubes have the same contour as the bottom surface of the glass sheet.

25. A method for bending glass sheets, comprising:

". . . a source 44 of quenching gas and a connector 46 for connecting the source of quenching gas to the quench tubes 32." (Column 6, lines 8-10).

Upper quench tubes 32 are shown arranged in longitudinal rows in Fig. 3.

Lower quench tubes 32 are shown arranged in longitudinal rows in the Fig. 2 "plan view of a lower bending platen", (column 4, line 7).

". . . upper platen further includes an actuator 42 . . . for raising the upper platen . . . and furthermore allow for returning the upper platen to a planar shape" (Column 5, line 61 to column 6, line 2); "an actuator 16 for deforming the (lower) platen from a planar shape to a bent shape", re Figures 5-8. See also last 4 lines of Abstract; column 2, lines 38-42; column 3, lines 24-27; and column 5, lines 35-38.

". . . glass heating furnace, not shown" (column 4, lines 22-23).

providing an oven having a heating section

and a bending section with mini-rollers;

heating the glass sheet in the heating section of the oven to a hot, softened, bendable condition;

bending the hot, softened glass sheet in the bending section by changing the vertical position of the mini-rollers supporting the glass sheet to a glass bending position where the vertical position of the mini-rollers across the width of the oven has a contour which conforms to the contour of a desired glass bend;

allowing the softened glass sheet to bend to the desired bent shape of the mini-rollers; and

quenching the bent glass sheet.

As shown in Fig. 2 of the drawings, "the lower platen 14 includes ... drive wheels 30" (Column 5, lines 39-43). ". . . heated in a glass heating furnace . . ." (Column 6, lines 22-23).

"After the heated glass sheet 12 has been indexed onto lower platen 14, by operation of drive wheels 30, . . . the lower platen 14 is raised and deformed by actuator 16 to a pre-set profile to bend the heated glass sheet 12" (Column 5, lines 24-28).

"The glass sheet 12 is then immediately quenched to provide the desired mechanical characteristics." (Column 6, lines 34-36).

As outlined above, applicants believe that claims 17-25, as amended, satisfy the requisites of 35 U.S.C. § 112.

Regarding the Examiner's specific objections to claims 21-25, the specification discloses the use of a "glass heating furnace" for heating the glass sheet prior to bending as well as disclosing the bending section. Also, as previously discussed, the mere fact that the embodiment of applicants' invention disclosed in the Figures may be utilized to both bend and temper a glass sheet does not limit the teachings by applicants of the disclosed structure as a

bending apparatus. Likewise, the disclosure clearly enables any person skilled in the art to make the disclosed deformable quench.

Moreover, the Examiner's distinction between "mini-rolls" and "wheels" is a distinction without a difference. Both terms clearly describe the same item, 30, to engage and convey the glass sheet during bending (see column 5, lines 39-43). Also, while the specification discloses actuator means which provide the dual function of positioning the wheels during bending and the quench tubes for quenching, this dual function does not prohibit applicants from claiming the actuators for performing either of those operations.

Finally, claim 17 has been amended to specifically recite that the quench tubes include surfaces having quench openings, which surfaces are positioned as described. Claim 18 has been similarly amended.

Summarizing, it is submitted that, as amended, claims 17-25 now satisfy the requisites of 35 U.S.C. § 112.

Applicants respectfully disagree with the Examiner's statement that "Bending of the glass sheet is required using the disclosed apparatus prior to the tempering of the bent glass sheet therein." Applicants object of the invention recites:

"Another object of the invention is to provide an apparatus that has movable quench openings that move with the surfaces of the flat glass sheet to provide equal thermal conditions during tempering and a more uniformly tempered glass sheet." (Column 2, lines 38-42).

Applicants believe that a skilled artisan reading the specification and the quotations hereinabove taken therefrom could only conclude that such object is reasonably supported with bending omitted.

The Substitute Declaration

Applicants have submitted a new declaration as a substitute for those now in this reissue application. Applicants submit that this substitute declaration has addressed the objections of the Examiner and is now in compliance with 37 C.F.R. § 1.63 and 37 C.F.R. § 1.175(a). It should be noted that applicants' January 8, 1993 Preliminary Amendment returned the specification to its original disclosure.

Prior Art Rejections

Claims 1-19 were rejected on the grounds of obviousness-type double patenting. Applicants are submitting herewith a photocopy of a fully executed Terminal Disclaimer, (the original of which will follow) relating to the '398 patent. Applicants also confirm that each of the '398, '531, and '824 patents, as well as this application, are commonly owned. As this was the sole basis for the Examiner's rejection of these claims, allowance is respectfully requested.

Claims 21, 22 and 25 were rejected under 35 U.S.C. § 102(b) as anticipated by, or in the alternative under 35 U.S.C. § 103, as obvious over, Owen. Owen discloses a glass sheet bending and case hardening apparatus including a horizontal roller runway which supports and conveys the glass sheet. The horizontal roller runway can be sagged, thereby allowing the glass sheet to bend by gravity. However, Owen does not disclose or suggest a plurality of mini-rollers arranged in longitudinal rows spaced apart across the width of the oven for conveying the glass sheet. Nor does Owen disclose or suggest means connected to each row of mini-rolls to change the vertical position of the mini-rollers to a glass bending position which has the contour of the desired

bend for bending the hot softened glass sheet to the desired contour. For these reasons, claims 21, 22 and 25 are all believed to be patentably distinguishable over the cited art.

Conclusion

This Amendment is believed to be fully responsive to the rejections, objections, comments and suggestions of the Examiner, and to place this reissue application in condition for allowance. Moreover, claims 20-23 and 25 have been copied in all material respects from U.S. Patent No. 5,009,693 and are believed in condition for a determination of priority.

The undersigned invites the Examiner telephone the undersigned to answer any questions he may have regarding this reissue application or its Amendment.

Respectfully submitted,

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